

REMARKS

Applicants respectfully thank the Examiner for acknowledging both the claim for foreign priority in this Application as well as the previously-filed Information Disclosure Statement (IDS).

In response to the Office Action dated June 07, 2010, Applicants request reconsideration based on the amendments herein and at least the following remarks. Applicants respectfully submit that the claims as presented herein are in condition for allowance.

Claims 1-10 are pending in the present application (claims 1, 4, 5 and 10 being independent). Claims 1-4 are withdrawn as being directed to non-elected subject matter in the March 17, 2010 response to Restriction Requirement of February 17, 2010. Claims 5, 7 and 9 have been amended, while claims 6, 8 and 10 have been canceled, leaving claims 5, 7 and 9 pending for reconsideration.

No new matter has been added by the amendments. Specifically, support for the amendments can be found at least in claims 6 and 8, canceled herewith.

Applicants respectfully request reconsideration of claims 5, 7 and 9 based upon the amendments and at least the following remarks.

Specification

It is respectfully noted that the title of the invention has been amended to "ANODE ACTIVE MATERIAL FOR LITHIUM SECONDARY BATTERY AND A METHOD FOR PREPARING THE SAME," to be clearly indicative of the disclosures of the application.

Claim Rejections Under 35 U.S.C. §112

Claims 5-10 stand rejected under 35 U.S.C. § 112, first paragraph, as allegedly failing to comply with the enablement requirement. Specifically, the Examiner states on pages 3-4 of the Office Action that due to the breadth of the claims

with regard to “a material having an absolute value of oxide formation enthalpy greater than that of the silicon oxide and also a negative oxide formation enthalpy” which would create the claimed complex as claimed in claims 5-6 and 10 would require undue experimentation.

It is respectfully noted that claims 6 and 10 have been canceled, and claim 5 has been amended to recite, *inter alia*, “wherein **the material having the negative oxide formation enthalpy**, the absolute value of which is greater than the absolute value of the oxide formation enthalpy of the silicon oxide, **comprises Al**.” (Emphasis added)

Accordingly, it is respectfully requested that the above rejections to claims 5-10 under 35 U.S.C. § 112, first paragraph, be withdrawn.

Claims 5-10 stand rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which the Applicants regard as the invention. Specifically, the Examiner states on page 4 of the Office Action that claims 5 and 10 contain a relative term “ultra-fine,” rendering these claims indefinite, and claim 5 recites the limitation “carbon material,” for which there is insufficient antecedent basis.

It is respectfully noted that claims 5 and 10 have been amended to remove the phrase “ultra-fine” therefrom, and claim 5 has been further amended to provide antecedent basis for “carbon material,” as the Examiner suggests.

Accordingly, it is respectfully requested that the above rejections to claims 5-10 under 35 U.S.C. § 112, second paragraph, be withdrawn.

Claim Rejections Under 35 U.S.C. §102

To anticipate a claim under 35 U.S.C. § 102, a single source must contain all of the elements of the claim. *Lewmar Marine Inc. v. Barient, Inc.*, 827 F.2d 744, 747, 3 U.S.P.Q.2d 1766, 1768 (Fed. Cir. 1987), cert. denied, 484 U.S. 1007 (1988). Furthermore, the single source must disclose all of the claimed elements “*arranged*

as in the claim.” Structural Rubber Prods. Co. v. Park Rubber Co., 749 F.2d 707, 716, 223 U.S.P.Q. 1264, 1271 (Fed. Cir. 1984). Missing elements may not be supplied by the knowledge of one skilled in the art or the disclosure of another reference. *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 780, 227 U.S.P.Q. 773, 777 (Fed. Cir. 1985). (Emphasis added).

Claims 5, 7 and 10 stand rejected under 35 U.S.C. § 102(e) as being allegedly unpatentable over Aramata et al. (U.S. Patent Publication No. 2003/0215711, hereinafter “Aramata”) as stated on page 5 of the Office Action. Applicants respectfully traverse for at least the following reasons.

Applicants respectfully note that claim 1 has been amended to incorporate the limitations of canceled claims 6 and 8, and thereby recites, *inter alia*, “(a) a step of producing **a complex composed of Si particles and an oxide surrounding the Si particles by mixing a silicon oxide and a material** having a negative oxide formation enthalpy (ΔH_{for}), an absolute value of which is greater than an absolute value of the oxide formation enthalpy of the silicon oxide by a mechanochemical process or subjecting them **to a thermochemical reaction** to reduce the silicon oxide; (b) a step of mixing the complex and a carbon material; and (c) a step of surface-modifying by **coating the anode active material with a low crystalline or amorphous carbon material**, wherein **the material** having the negative oxide formation enthalpy, the absolute value of which is greater than the absolute value of the oxide formation enthalpy of the silicon oxide, **comprises Al**.” (Emphasis added)

Applicants respectfully note that Aramata is directed to conductive silicon composite in which particles of the structure that silicon crystallites are dispersed in silicon dioxide are coated on their surfaces with carbon. However, Applicants respectfully note that Aramata does not disclose a step of producing **a complex composed of Si particles and an oxide surrounding the Si particles by mixing a silicon oxide and a material comprising Al to a thermochemical reaction**. Rather,

Aramata merely discloses that the steps of using silicon oxide powder as a starting material, heat treating the silicon oxide powder in an atmosphere containing an organic gas and/or vapor for causing disproportionation of the silicon oxide powder as the starting material into a composite of silicon and silicon dioxide, and simultaneously effecting chemical vapor deposition on its surface, as stated at paragraph [0038]. In addition, as the Examiner states on page 6 of the Office Action, Aramata does not disclose **coating the anode active material with a low crystalline or amorphous carbon material**.

In contrast and in accordance with the present application, as specifically recited in amended claim 5 and shown at least at Example 1 on page 10 of the detailed description, the claimed method is directed to (a) a step of producing a **complex composed of Si particles and an oxide surrounding the Si particles by mixing a silicon oxide and a material** having a negative oxide formation enthalpy (ΔH_{for}), an absolute value of which is greater than an absolute value of the oxide formation enthalpy of the silicon oxide by a mechanochemical process or subjecting them to a **thermochemical reaction** to reduce the silicon oxide; (b) a step of mixing the complex and a carbon material; and (c) a step of surface-modifying by **coating the anode active material with a low crystalline or amorphous carbon material**, wherein **the material** having the negative oxide formation enthalpy, the absolute value of which is greater than the absolute value of the oxide formation enthalpy of the silicon oxide, **comprises Al**.

Therefore, Aramata does not teach or suggest “(a) a step of producing a complex composed of Si particles and an oxide surrounding the Si particles by mixing a silicon oxide and a material having a negative oxide formation enthalpy (ΔH_{for}), an absolute value of which is greater than an absolute value of the oxide formation enthalpy of the silicon oxide by a mechanochemical process or subjecting them to a thermochemical reaction to reduce the silicon oxide; (b) a step of mixing the complex and a carbon material; and (c) a step of surface-modifying by coating the anode active material with a low crystalline or amorphous carbon material, wherein the material having the negative oxide formation enthalpy, the absolute value of

which is greater than the absolute value of the oxide formation enthalpy of the silicon oxide, comprises Al" as in independent claim 5. As a result, Aramata does not disclose all of the claimed elements arranged as in claim 5.

Thus, it is respectfully submitted that claim 5, including claims depending therefrom, i.e., claims 7 and 9, define over Aramata.

In addition, it is respectively noted that claim 10 has been canceled.

Accordingly, it is respectfully requested that the above rejection to claims 5, 7 and 10 under 35 U.S.C. § 102(e) be withdrawn.

Claims 5, 6, 9 and 10 stand rejected under 35 U.S.C. § 102(e) as being allegedly unpatentable over Gao et al. (U.S. Patent Publication No. 2006/0057463, hereinafter "Gao") as stated on page 6 of the Office Action. Applicants respectfully traverse for at least the following reasons.

Applicants respectfully note that Gao is directed to a method of making a composite compound of lithium oxide having tin nanoparticles dispersed therein by reacting lithium metal with a tin oxide material, as states at paragraph [0031]. However, Applicants respectfully note that Goa is silent as to **mixing a silicon oxide and a material comprising Al to a thermochemical reaction**. In addition, Goa does not disclose **coating the anode active material with a low crystalline or amorphous carbon material**. Rather, Goa merely discloses the surfaces of the composite compositions may also be passivated by reacting the composite composition with **carbon dioxide** to form a lithium carbonate passivation layer, as stated at paragraph [0038]

In contrast and as noted above, the claimed method is directed to (a) a step of producing **a complex composed of Si particles and an oxide surrounding the Si particles** by **mixing a silicon oxide and a material** having a negative oxide formation enthalpy (ΔH_{for}), an absolute value of which is greater than an absolute value of the oxide formation enthalpy of the silicon oxide by a mechanochemical process or subjecting them **to a thermochemical reaction** to reduce the silicon oxide; (b) a step of mixing the complex and a carbon material; and (c) a step of surface-

modifying by **coating the anode active material with a low crystalline or amorphous carbon material**, wherein **the material** having the negative oxide formation enthalpy, the absolute value of which is greater than the absolute value of the oxide formation enthalpy of the silicon oxide, **comprises Al**.

Therefore, Gao does not teach or suggest “(a) a step of producing a complex composed of Si particles and an oxide surrounding the Si particles by mixing a silicon oxide and a material having a negative oxide formation enthalpy (ΔH_{for}), an absolute value of which is greater than an absolute value of the oxide formation enthalpy of the silicon oxide by a mechanochemical process or subjecting them to a thermochemical reaction to reduce the silicon oxide; (b) a step of mixing the complex and a carbon material; and (c) a step of surface-modifying by coating the anode active material with a low crystalline or amorphous carbon material, wherein the material having the negative oxide formation enthalpy, the absolute value of which is greater than the absolute value of the oxide formation enthalpy of the silicon oxide, comprises Al” as in independent claim 5. As a result, Gao does not disclose all of the claimed elements arranged as in claim 5.

Thus, it is respectfully submitted that claim 5, including claims depending therefrom, i.e., claims 7 and 9, define over Gao.

In addition, it is respectfully noted that claims 6 and 10 have been canceled.

Accordingly, it is respectfully requested that the above rejection to claims 5, 6, 9 and 10 under 35 U.S.C. § 102(e) be withdrawn.

Claim Rejections Under 35 U.S.C. § 103

For an obviousness rejection to be proper, the Examiner must meet the burden of establishing that all elements of the invention are disclosed in the prior art and that the prior art relied upon, coupled with knowledge generally available in the art at the time of the invention, must contain some suggestion or incentive that would have motivated the skilled artisan to modify a reference or combined references. *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988); *In Re Wilson*, 165 U.S.P.Q. 494, 496

(C.C.P.A. 1970); *Amgen v. Chugai Pharmaceuticals Co.*, 927 U.S.P.Q.2d, 1016, 1023 (Fed. Cir. 1996).

Claim 8 stands rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Aramata in view of Matsubara et al. (U.S. Patent Publication No. 2002/0164479, hereinafter “Matsubara”), as stated on pages 6-7 of the Office Action. Specifically, the Examiner states that Aramata teaches all elements of claim 8 except “coating both the silicon compound and conductive agent, which combined create a composite material, with a low crystalline or amorphous carbon material,” which the Examiner further states is disclosed by Matsubara, primarily at Abstract and paragraph [0002]. Applicants respectfully traverse for at least the following reasons.

As noted above, claim 8 has been canceled.

Accordingly, it is respectfully requested that the rejection of claim 8 under 35 U.S.C. § 103(a) be withdrawn.

In addition, independent claim 5, amended to incorporate the limitations of claim 8, is submitted as being allowable for defining over Aramata, as discussed above.

Furthermore, it is respectfully submitted that “coating both the silicon compound and conductive agent, which combined create a composite material, with a low crystalline or amorphous carbon material,” as allegedly taught by Matsubara, or any other disclosure of Matsubara, does not cure the deficiencies noted above with respect to Aramata.

As a result, neither Aramata nor Matsubara, either alone or in any combination thereof, teach or suggest “a) a step of producing a complex composed of Si particles and an oxide surrounding the Si particles by mixing a silicon oxide and a material having a negative oxide formation enthalpy (ΔH_{for}), an absolute value of which is greater than an absolute value of the oxide formation enthalpy of the silicon oxide by a mechanochemical process or subjecting them to a thermochemical reaction to reduce the silicon oxide; (b) a step of mixing the complex and a carbon material;

and (c) a step of surface-modifying by coating the anode active material with a low crystalline or amorphous carbon material, wherein the material having the negative oxide formation enthalpy, the absolute value of which is greater than the absolute value of the oxide formation enthalpy of the silicon oxide, comprises Al," as recited in independent claim 5.

Thus, it is respectfully submitted that claim 5, including claims depending therefrom, i.e., claims 7 and 9, define over the cited references.

Conclusion

In view of the foregoing remarks distinguishing the prior art of record, Applicants respectfully submit that this application is in condition for allowance. Early notification to this effect is requested. The Examiner is invited to contact Applicants' attorneys at the below-listed telephone number regarding this Amendment or otherwise regarding the present application in order to address any questions or remaining issues concerning the same.

If there are any charges due in connection with this response, including for any necessary extensions of time under 37 C.F.R. 1.136(a) or 1.136(b), for which the Applicants hereby respectfully petition, please charge them to Deposit Account 06-1130.

Respectfully submitted,

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